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VOL. 5 NO. 1

AMERICAN JOURNAL OF OPTOMETRY

PHOTOPHOBIA, AND ITS TREATMENT WITH TINTED LENSES

W. H. Glazer, LL.B., Opt. D.
Philadelphia, Pa.

There comes to mind the statement of a chemist engaged in the manufacture of pharmaceuticals that the great majority of physicians would not know the resulting color of a medicine they had prescribed; further, that physicians often rely on the manufacturer's descriptions and assertions of the virtues of medicinal formulae for the cure of various ailments. I am told by druggists that physicians not infrequently prescribe patent medicines that have been foisted upon them by itinerant salespeople. Sometimes, I sense that the chemist and druggist have a large contempt for the type of physician who doesn't know the stuff he is prescribing, and what it will actually do.

How much of truth there is in what I have just said, I don't know. I am reluctant to believe that it applies to the majority of able physicians who take their work and responsibilities seriously. I do know, however, that, in the realms of tinted or colored lenses, many of us are placed in the same position as the type of physician to which I have above referred. The manufacturing optician, our jobbers, and salespeople are telling us what is best for light-sensitive eyes, and we are letting them go unchallenged. If the story is told often enough, and enough money spent in leaflets and other forms of advertising, some of us become sold on a particular tint, and we, in turn, peddle the same fables to our patients. I think we, as optometrists, who take our work and our responsibilities seriously, ought carefully to guard ourselves against accepting the word of the jobber, the manufacturer, and their salespersons as to the value of a particular tint or color. We should be in position to tell them, and

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tell them strongly, that we are the authorities on what we are going to prescribe in behalf of the patient's best ocular interests.

Now, I think it is not difficult to classify the conditions that may demand the use of tinted lenses. We name them in the reverse order of their importance, as:

1. geographical and climatic.
2. occupational.
3. ocular physiologic perversions.
4. ocular and general disease.
5. age factors.

What we have in mind, in resorting to tinted lenses, of course, is protection from the harmful and painful effects of light. This assumes at once that light can be harmful and can cause pain. Now, I think all of us realize that there are two essential conditions regarding light that must be satisfied, if we are to accomplish our aim. We must combat light intensity, or light energy that rises above the limit of normal comfort, so as to avoid the evil effects of chronic irritation; and we must combat the inherent vice of specific portions of the spectrum, visible and invisible. Of the latter, we have come to know about infra-red and ultra-violet energy waves. Probably, there are other energy waves that, under certain conditions, can be as harmful and destructive as the two mentioned, although they have not, to my knowledge, been discovered. We must await their Newton.

The monsters that we have been taught to fear by the manufacturer, jobber and salesperson, according to the eminent scientists, Verhoeff and Bell (Science, 40, page 452, 1914; Elect. Rev., 75, page 503, 1914; Proc. Amer. Acad. Arts and Sci., 51, page 630, 1916), are not such deadly shafts after all. They apparently say that no artificial source of light used for illuminating purposes contain enough ultra-violet radiation to be injurious to the eye, under practical working conditions; and the infra-red rays have no specific action distinct from the thermal or heating effect. It is, however, admitted that exposure to an excess of ultra-violet light will cause conjunctivitis. I would caution that we do not accept this as the entire, true story; rather, that we, individually and collectively, gather occupational and other data as corroborative evidence in our Archives for future analysis.

In respect to infra-red energy waves, Luckiesch (The Amer. Jour. of Physiological Optics, Vol. II, 1921) points out that these waves are totally absorbed in the vicinity of the pupil-aqueous, never reaching the fundus. In this, as in the case of ultra-violet radiations, I again caution the acceptance of this statement as the whole truth. We all know the accepted theory that fluorescence is due to a conversion in wave length from the short invisible ultra-violet waves to the longer visible waves. It is altogether possible that there is not

total conversion of the infra-red energy waves into heat, but there may be a metamorphosis of wave length to some subtle energy vibration not yet detected and understood.

It seems a pretty well established fact that ordinary ophthalmic glass without tint cuts off the ultra-violet energy waves to a great extent. This fact may sometime in the future condemn the use of ophthalmic glass in favor of quartz or other transparent mineral of like properties. In this departure, I have often been led to wonder why people whose ametropia had been beautifully corrected found it restful to get their glasses off for a time. Chemists know the effect of light on organic chemistry, perfectly or imperfectly. Some have sought the abolition of the ultra-violet, some, the abolition of the infra-red, while others have been content to reduce quantity and ignore quality of light, while holding the latter unimportant, or at least, not harmful. Each group is probably right under given circumstances, and probably wrong in respect to all circumstances. I don't know, and I should so very much like to know. I, like others, am inclined to fall back on the general theory or inherent belief that what the Great Creator put into light he meant to be beneficial for mankind. If, under some conditions, there be harmful agencies in light, He has divinely provided protecting natural agencies. Like everything else, these protecting natural agencies (we know some of them, but not all of them) may be absent in a few, impaired in many, and permanently destroyed in not a few.

Therefore, whatever I may hereinafter say as to the beneficent purposes that glass and tinted glass may serve, I suppose I shall startle the conservative element of our group when I say that I shall advocate to each of my patients that he remove his glasses for half-hour intervals probably, in order that the ocular tissues shall have unadulterated light baths. Care will be taken to describe the ideal conditions under which such light baths may be safely taken, which measure, I hope, too, will in part neutralize the light-stoppage effect of our zyl-rimmed glasses.

However, returning to our original themes, having in a manner briefly touched on the factors to be curbed by and through the use of tinted lenses, let us turn our attention for a brief discussion of the when and why of their use from the anatomic, physiologic and pathologic considerations.

If there were a real standard man on whom to base departures from the normal, safe light intensity endurance, it would probably not be difficult to say exactly when a protective device in the nature of colored lenses should be resorted to. That is self-evident. One pair of healthy eyes can endure a tremendous light intensity; another equally healthy pair of eyes would find the same light intensity intolerable. Why that is so may be explained in the universal application of evolutionary doctrine, *i. e.*, healthy progenitors passing ac-

quired immunity to the so-called stage of natural immunity.

How does the Optometrist ascertain if there is light-sensitiveness or photophobia? If the patient himself has not made mention of the fact, the Optometrist may, as a passing fancy, ask the patient if he is light sensitive. Some Optometrists do become whimsical, as is their right, and ask pertinent questions, hardly from the standpoint of gain, you know, that may be derived from incorporating a color in the prescription, but in the patient's best ocular and general welfare. If the patient has not voluntarily given the information that he is photophobic, one should beware of the answer to the question direct, "Are you sensitive to light?" I believe the average patient will search his experience on the last brightest day when his eyes have been exposed to conditions that would be intolerable to the eyes of the standard man and make the answer that will lead to the unjustifiable use of colored lenses. If the individual is not actually photophobic, such incorporation of color may condemn an able refraction, and your judgment and ability, if not your very integrity, for I take it as a fact that a color is resented unless it serves the purpose for which it is properly intended. The safest test is your own judgment, honestly arrived at as a professional man who knows what he is doing. You know the patient's occupation, usually whether or not there is present ocular or general disease, whether or not he is of the golfing, bathing and fishing class, whether he belongs or is going to hot climes (excluding, of course, Terra Diabolorum), and, finally, about how old the patient is. Your review, and your judgment based theron, not your patient, nor the manufacturer, nor the jobber, nor the salesperson, should determine when a tint is necessary and what tint is best. By no means do I intend to disparage the fruitful work of scientists in the research laboratories of great manufacturers; I do mean to condemn the cheap commercialization, through magnification of actual worth and truth until only a distorted view thereof may be had.

All of us know of the pigmented iris diaphragm, of the circular pupil, with its fluctuating diameter, and of the internal pigmentary layers of the choroid. Aside from its business of distracting us men by its challenging arrays of luscious colors to our psychic intelligence, we know the said pigments' duty is to estop useless, irritating light from entering the eye. The iris curtain, with its radiating and sphincter muscle arrangement permits the variation in pupillary diameter that regulates the quanity of light that may enter the eye for the performance of vision, and, as I have heretofore remarked, bathing the internal structures that thrive on useful light action. Further, we know the purpose of the internal pigments to be the absorption of light or radiant energy that would impair pure retinal function, and to absorb excess energy that may enter the eye via light. Impairment of the pure retinal picture, *per se,* is, I think, of small import.

An absence of pigment in the iris, as in the case of the Albino, certainly warrants the use of colored lenses; the impairment of function of the iris-pupil caused by any factor as local disease or general illness, demands peremptorily the use of colored lenses; and, finally, the impairment of internal structures through any cause, will peremptorily demand the use of colored lenses.

Healthy eyes demand aid and protection against geographical and climatic conditions; sick eyes and sick persons demand more help and protection under the same conditions.

Healthy eyes demand aid and protection against certain occupational duties, as in working in places that cause exposure to artificial or natural light of great intensity; sick eyes and sick persons on the job need more help and protection under the same conditions.

Healthy eyes, suffering from ocular physiologic perversions, *i. e.*, errors of refraction and muscle imbalances, do not need colored lens aid, because the uncomfortable reflexes are probably always transitory. Sick eyes and sick persons need some aid and portection under like conditions, often depending upon whether they are sensitive or phlegmatic, and upon conditions already described attending. Care should be taken not to use a depressing color on a sick, sensitive or neurotic.

In ocular and general disease, color should always be resorted to. In the former, especially where there is any interference in function by the iris-pupil, it should be resorted to as a prophylactic measure. In the latter it should be a valuable therapeutic agent, not now recognized for its worth by not a few physicians. The iris-pupil works; there is expenditure of nervous energy of an already depleted neural supply; the conservation of such energy, in addition to a psychic effect of ocular rest, for release in directions most needed, could be the feather that would turn the scales in the direction favorable to the patient. That message ought to be suggested to every physician. An answer that the room can be darkened would be out of joint with our present-day understanding and appreciation that the patient needs plenty of sunlight to combat the pathogenic organisms he is constantly throwing off.

And, now, I come to the age factors. The healthy aged, and the sick and infirm aged, more so, need aid and protection. The iris muscles are in nowise different from those in any other part of the body. They are toughening up more or less in individual cases. The vigorous, rapid thrusts through the aqueous is not so readily accomplished by the aged iris-pupil. One must never forget that the iris-pupil is the safety-valve or regulator of light, quantitatively, and, in some measure, qualitatively. As I pointed out some time ago, our efforts may materially reduce suffering and blindness through cataractous and glaucomatous causes of today. A little help to Nature at times may and can mean much.

I think none of us is going to stand listlessly by and do nothing. We should try, we are trying, and shall continue to try, I hope, in orderly, scientific manner to discover the ideal lens material, whether it be a modification of our present glass substance, the introduction of quartz, or other transparent mineral substance, together with the best neutralizing agent or agents, that will best enable the conservation and restoration of normal vision with comfort under all conditions. We want our Archives started; we want it working; we want it to produce.

Insofar as our meager knowledge, supported by the best authoritative opinions of our day will permit, we can proceed somewhat along the lines recommended by Coblentz and Emerson (Technologic Papers, Bureau of Standards, Bulletin No. 93), a paper entitled, "Glasses for Protecting the Eyes from Injurious Radiations," as follows:

> "For protecting the eye from ultra-violet light, black, amber, green, greenish yellow, and red glasses are efficient. Spectacles made of white crown glass afford some protection from the extreme ultra-violet rays which come from the mercury-in-quartz lamps and from electric arcs between iron, copper, or carbon. The vapors from these arcs emit but little infra-red radiation in comparison with the amount emitted in the visible and in the ultra-violet.
>
> "For shielding the eye from infra-red rays, deep black, yellowish green, sage-green, gold-plated, and bluish-green glasses are the most serviceable.
>
> "For working near furnaces of molten iron or glass, if considerable light is needed, a light bluish-green or sage green glass is efficient in obstructing the infra-red rays. For working molten quartz, operating oxyacetylene or electric welding apparatus, it is important to wear the darkest glasses one can use, whether black, green (including gold-plated glasses) or yellowish-green, in order to obstruct not only the infra-red, but also the visible and ultra-violet rays."

The foregoing recommendations should be of value, because we are not infrequently called on to make suitable recommendations to welders, furnace workers, and the like. However, the exact shade will have to be determined by your judgment in the light of your own knowledge of those matters which I have herein reviewed.

From a personal study of the transmission-absorption curves presented by the scientific staff of Bausch & Lomb, I look with favor upon the use of the Euphos tint, because there is maximum transmission of green energy waves, with uniform absorption of the invisibles of each end of the spectrum. I have been told that the glass is un-

obtainable in America. I, personally, do not like the Crookes, Amber B, Amethyst B, Smokes B, C, and D, nor the Blue B, C, and D, for the reason that there is too great an absorption of the yellow-green and relatively small absorption of extremes of the spectrum. Next to the Euphos, I do like Fieuzal A and B, Smoke A and Blue A. I do not see any superiority of the Soft-Lite or Viopake over some of the less expensive standards, unless the inducement to wear the Soft-Lite because of its apparent inconspicuousness over some of the others, overcomes the prejudice of a sensitive patient. There seems little choice in the relative values of all others. My ideal of what a colored lens should do is to give maximum transmission in the yellow-green, and gradual absorption throughout the remainder of the spectrum without attempt at total absorption into the invisible regions of the spectrum. As I have already contended, some of the latter must be necessary and beneficial. Empirical experiment will one day determine how much as a minimum is physiologically necessary. In the meantime, fifty percent of the normal quantity found at daylight intensity, pleasant for the standard man who should be created by our own researches, should remain.

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TOXIC AMBLYOPIA PRODUCED BY WOOD ALCOHOL RESIDUE FROM TOBACCO FERMENTATION

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Pearl River, N. Y.

There is not a wide awake optometrist who has not noticed on the breath of an occasional patient volatile traces of old "John Barleycorn," without noticing also a visual acuity, with and without correction, that is below par. Those of the profession who believe that "hitting-the-bottle" is an inalienable constitutional right naturally brush aside this evidence and refuse to make proper note of the cause —at least mentally—although sometimes they do note that the patient "overindulges." To this class of refractionists I am not writing and I place them in the category of another type who wilfully poison their patients' eyes with mydriatic.

Then again we note a class of patient who literally reeks with the odor of tobacco. I cannot blame a patient for liking to smoke after he or she has once acquired the desire. I know from experience that the hunger for it does not come to one naturally, but like olives the taste has to be acquired. In this class of clientele, whose spectacle frames are gummed-up at the corners with condensed tobacco vapors we also note a diminished visual acuity.

This brings us to a third class, those suffering from a decided toxic amblyopia. These patients are the ones who both smoke and drink habitually and frequently to excess. I offer no theory for the still lower rate of visual acuity in these cases except that it seems that the alcohol absorbed into the system acts as a solvent for tobacco poisons whereby the absorption by the body of these toxins is amplified.

But other than to state that the eighteenth amendment has worked wonders in its relation to the acuity of vision I will dwell no more on that form of "toping."

It has come to my notice since one of the tobacco companies has been conducting a nation-wide advertising campaign claiming wonderful voice-producing properties of a certain brand of toasted cigarette, that with the increased popularity of baked tobacco there is little or no diminution of the visual acuity in these particular patients who use this toasted tobacco, provided, of course, that they are abstainers from alcohol in liquid forms.

Other than to note this point I had applied no great attention to it until about a month ago when a German scientist announced through the newspapers and also stated in scientific lectures that the ordinary cigar contains an appreciable amount of wood alcohol.

We know that wood alcohol is destructive to the optic nerve and retina. This type of spirit is produced in the leaf during the curing or rotting process. In order to strip the fibers of the stems from the leaf without damaging the part to be left intact, the stem is drawn from the leaf at a time when it is slimy, due to decomposition. It cannot be drawn unless the leaf is in that condition. The fermentation process produces the alcohols.

Now, the longer the leaf is stored before it is used, the milder the tobacco becomes. The gum in it evaporates slowly and also other poison with it. To produce a mild smoke for the consumer it is necessary to store the tobacco for two years at least. We can see readily that in a business that runs into millions of dollars per month that many more millions of dollars plus accrued interest would be required to store such a great amount of stock until it would be fit for the man who prefers a mild smoke. The result is that a mild cigar that contains less alcohols and other toxins is rather rare.

The answer to this scientist's claim about the presence of wood alcohol in tobacco, by some men interested in the large sale of the weed is that the alcohol, if at all present, is of an infinitesimal amount and may be ignored (by them). Also, they claim, if it is present it is destroyed in the process of combustion and does not reach the smoker. Those of us who know the *modus operandi* of distillation and also of external combustion know that the highly volatile substances leave the mash before the flame reaches them. In smoking there is no flame; the oxidation takes place through surface combustion. Alcohols are highly volatile and it stands with reason that the wood alcohol in tobacco leaves the fiber as the hot gases of this combustion pass over it and it is inhaled into the mouth and nasal passages where it is absorbed by the mucosa.

If the alcohol produced in the curing of tobacco were wholly grain alcohol I would not be tempted to write on the subject, but with the records of diminished vision before me of patients who suffer from a form of amblyopia due to wood alcohol poisoning from smoking and not from the consumption of liquid alcohol via the stomach route I cannot do otherwise.

It is not my business to advertise any brand of idle amusement or pastime, but I state with my history records before me that, for smokers, a brand of tobacco which has undergone the pre-distilling process of "toasting" is less harmful to the optic nerve tract than that which has not been so treated.

DR. MALCOLM H. TALLMAN,
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HYPEROPIA

William Smith, Opt. D., D. O. S.
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Introduction

This paper contains an analytical study of the history, definition, varieties, causes and methods of correction of hyperopia, particularly latent hyperopia and conditions resulting from it.

In compiling the elementary part of this paper, that is, the part preceding the one dealing with the correction, the writer consults authorities as Fuchs, Laurance and C. H. Brown, for his information. The methods of correction, the clinical *"modus operandi"* and the clinical observations are from this writer's own vast collection of notes, records and personal observations and research in the refracting room together with observations by the authorities named and others whose names appear from time to time in our technical publications.

Historical

Although hyperopia had been mentioned and described by previous writers somewhat indefinitely, it was reserved for Donders to reduce the knowledge concerning it to scientific accuracy; but it was not until 1848 that he published his first description of this defect, and cleared the optical atmosphere surrounding it, which had previously been cloudy and misty with speculation and error.

The elucidation of this hitherto mysterious defect was the magnificent result of many years of patient toil and systematic investigation of the subject, in the light of the knowledge concerning it which was at that time the property of the scientific men of the day, together with the added fruit of Donder's own research and discovery, just as many other great truths have been evolved by a similarly slow process but by a persistent application such as characterized the labors of many of the great minds of the age.

Formerly presbyopia and hyperopia were confounded with each other. People saw a hyperopic boy, whose eyes soon grew tired in studying, finally take up his grandfather's glasses and then read well with them and without becoming tired. This boy, they reasoned, must have the same sort of weakness in his eyes that his grandfather has, only that with him it has already set in in youth, and therefore was very serious. This *"habetude visus"* was attributed to a weakness of the retina, and it was believed that it might possibly result in blindness. The only thing which might have ameliorated the sufferings of the hyperope—namely the use of glasses—was held to be particularly dangerous.

Donders deserves the great credit of having discovered the true nature of these conditions. The weak sight of the old man is pres-

byopia and has reference to the accommodation. It is, however, not an anomaly of the accommodation, but a physiological state. The boy's bad sight depends upon hyperopia, which has nothing to do with the accommodation, but is an error of refraction that exists in the eye even when destitute of accommodation. The similarity of the conditions lies in their having one symptom in common—namely, impairment of vision for near points—and yet even in this regard there is an essential difference between the two. In presbyopia distinct vision inside of a certain distance is simply impossible. In hyperopia, distinct vision at near points is generally still possible (if the range of accommodation is great enough), but is associated with straining and tiring of the eyes.

Donders has also shown that the asthenopia of hyperopes is not the symptom of a serious lesion of the eye, but is an evidence of fatigue consequent upon unfavorable optical conditions. By the correction of these conditions with simple optical devices, a countless number of men have, since this discovery, been rendered once more capable of work and have been relieved of the dread of growing blind.

Etiology

Hyperopia, or hypermetropia is the condition of an eye in which, when the accommodation is suspended, parallel light would come to a focus behind the retina. This is caused by a shortening of the anteroposterior diameter of the eyeball, while the refracting power is normal, or from the length being normal while the refracting power is deficient. The former is termed axial, and the latter refractive hyperopia. In both cases the focal length is greater than the distance from the principal point to the retina. Hyperopia does not exist solely because the refraction is deficient or the eye is too short, but because the refraction is deficient for the length or the length deficient for the refraction.

Hyperopia is generally always congenital or original, because shortening of the globe is not acquired (there is, however, an acquired hyperopia, we will discuss that later). Almost all newborn children are hyperopic, their eyes being originally contracted too short in proportion to the refractive power of the media. As the child grows, the eyeballs elongate in proportion, and acquirement or not of hyperopia, as found later in life depends simply on the axial development with relation to the focal power. Thus, in a sense, hyperopia is developed or acquired because it is a condition of insufficient growth. It is also very often hereditary. Slight degrees of hyperopia are so frequent that it must be regarded as the most common refractive state, much more frequent than emmetropia itself, although the higher degrees of hyperopia are rather rare.

Refractive hyperopia may result from an abnormally low curvature of the cornea or crystalline. This is known as "curvature hyperopia." Or it may be due to a low index of refraction of the cornea and aqueous, a high index of the cortical layers of the lens; or to a low index of the nuclear portion of the lens, or to a high index of the

vitreous. With the exception of the condition of the high index of the cortical layers of the lens, none of the conditions of altered refractive indices are demonstrated in a healthy eye. Curvature hyperopia due to the cornea, is also sufficiently rare and indeed the hyperopic eye is more likely to have a cornea of slightly greater curvature than is found in emmetropia. Congenital hyperopia is not assigned to the influence of the crystalline.

Shortness of the globe is therefore the common cause for hyperopia. The axially hyperopic eye is shorter than the emmetropic eye approximately .033 *mm.* for each diopter of error. Thus, in hyperopia of 3D. it is shortened 1 *mm.* Refractive hyperopia produces a higher degree of error. In the radius of curvature hyperopia, the variation of one millimeter in the anterior curvature of the cornea, produces 6 D. of error.

Acquired hyperopia may result from (a) Removal or dislocation of the crystalline lens—aphakia, (b) increase of the refractive index of the vitreous humor due to general disease, (c) decreased refractive power of the eye due to age. The condition mentioned under (c) especially applies to this class of hyperopia. It becomes noticeable at the age of fifty or fifty-five, when an eye previously emmetropic becomes hyperopic, or if previously hyperopic the defect increases, while myopia becomes less, and later becomes emmetropic or even slightly hyperopic.

The causes of this condition are not thoroughly understood. Although several explanations have been forwarded for this, they weren't definitely proved. The correctness of this type of hyperopia is the same as for axial hyperopia.

Overcorrected myopia produces a form of artificial hyperopia. In this condition the over-strong concave lenses cause a greater divergence of the rays bringing them to a focus in back of the retina instead of on it, in the same way as a true hyperopia. This calls forth accommodative action to correct the defect. The treatment of this particular condition is to remove the cause.

Types of Hyperopia

Hyperopia has been subdivided into manifest and latent. Manifest hyperopia has further been subdivided into:

(1) Relative
(2) Absolute
(3) Facultative

1. Relative hyperopia is that form of hyperopia in which vision becomes normal or improved by means of convergence to a near point. The entire accommodative power added to the natural refractive condition does not prove sufficient to render the eye artificially emmetropic. In order to accomplish this the hyperope has to resort to squinting. This condition sometimes resembles myopia, and is often corrected as such.

2. Absolute hyperopia is the term applied to these cases where

distinct vision is impossible without artificial assistance. Such an eye is entirely dependent upon convex lenses for any distinct vision at all.

3. Facultative hyperopia is that portion of hyperopia which is disguised by the accommodation. In this type distant objects can be seen as well with, as without convex lenses. In youth when the accommodation is vigorous the hyperopia is usually facultative.

Manifest hyperopia, therefore, is that portion of hyperopia which is found and corrected with the trail case. Latent hyperopia is that hyperopia which is hidden by a cramp of the ciliary muscle, and doesn't entirely relax upon the application of convex lenses.

Symptoms of Hyperopia

The hyperope (if the defect is not of too high a degree) usually sees well at a distance, but the presence of the defect is made known even in early life by the pain and symptoms of fatigue that follow near-point use of the eyes. By forcing the accommodation the hyperope may be able to read well for a while, but sooner or later the constant effort to contract the ciliary muscle sufficiently for near work causes fatigue and exhaustion of the muscle, and the accommodative effort can be maintained only by the greatest difficulty, and the patient is constantly reminded that he has eyes and that they are in a weak and painful condition.

The eyes feel strained, the print runs together and becomes blurred; the eyes feel tired, as though they were ready to close; the lids feel hot; they itch and smart; a dull frontal (sometimes occipital) headache accompanies this train of symptoms. In cases of nervous individuals constitutional ailments are included. Conditions of nervous indigestion, gastritis, hysteria, and even temporary insanity are observed. In short, the symptoms of hyperopia may be said to consist of pain and discomfort on using the eyes, and an indistinctness of the letters on a printed page.

Treatment

Having discussed the theoretical phase of hyperopia we are now ready to approach the subject from the practical side. We will make a study of the methods of correction of the defect, both from theoretical as well as from the clinical mode of observation. In the general run of cases the former holds true, while in a certain number of cases the practical results observed in the refracting room, differ from the theoretic findings, and require much additional individual attention and care. The methods for correcting these cases frequently have to be individually applied to each case. This writer believes that it is most advisable to study and treat each case of this category on its own merits.

Of all the forms and varieties of hyperopia we are concerned mostly with latent hyperopia, or that form of hyperopia which is disguised by the accommodation. With the exception of facultative hyperopia, manifest hyperopia in its various forms presents no difficulty in correcting. Facultative hyperopia, on the other hand, because

of its usual presence in younger persons, whose accommodation is vigorous, has some portion of itself hidden by the ciliary muscle and resembles latent hyperopia. This form of hyperopia is best examined and corrected by the same methods as is latent hyperopia. We will therefore include it in the same category as the latter and treat as such. But we will say, as we pass, a few words about the other forms of hyperopia, especially those conditions associated with heterophoria.

The writer is of the opinion, and has applied this in his practice with splendid results, that hyperopia combined with exophoria should be treated the same way as a hyperope who has an orthophoric muscle balance. The presence of the exophoria should in no way influence or alter the final prescription, and I believe it well to treat the hyperopia and the exophoria as two entirely separate conditions, and correct first the refractive error and then treat the muscular imbalance as is necessary.

I have divided latent hyperopia into two classes:

1. Simple latent hyperopia,
2. Advanced latent hyperopia.

1. Simple latent hyperopia is that form of latent hyperopia which can be partly corrected with convex lenses by the use of the fogging method. This form includes the facultative variety, and either technic of skiascopy, static or dynamic can be used with good results.

2. Advanced latent hyperopia is that form of latent hyperopia which will not respond to the clinical application of the strongest fogging lenses. This category includes cases of spasm of accommodation, amblyopia-ex-anopsia, and cases of lazy, irresponsive visual faculty. We find this last mentioned type of case occurring because of a lack of effort on part of the patient to obtain sharp visual perception. Failure of patients to wear corrective lenses, especially in cases where symptoms of discomfort are absent is frequently responsible for this condition, but it may also be due to some abnormality in the visual centers of the brain or nerve tract.

Amblyopia ex-anopsia (from non-use) occurs when there has been present from earliest youth an obstacle to vision in the eye, which makes the formation of sharp images upon the retina impossible. In this category belong cases of opacities, either of congenital origin or acquired early in life, situated in the cornea, lens, or in the region of the pupil (persistent pupilary membrane). Amblyopia also develops in an eye which has squinted since childhood, because in this case the perception of the retinal image in the squinting eye is suppressed, and the eye is thus popularly excluded from participation in the act of vision. In all these cases, the retina, owing to the lack of exercise, fails to attain that delicacy of function which belongs to the normal eye, or the functional capacity which has been already acquired is largely lost although absolute blindness never occurs.

It will be worth while to divert for a moment from the subject and discuss, somewhat superficially, a phenomenon closely related to

our theme—the physiology of accommodation. This is essential, since hyperopia in every form depends in some way upon this appearance.

Accommodation has been a stumbling block in physiological optics. Its physiology is hypothetical. It is built on a theory which is not applicable in all cases. Helmholtz describes its mechanism as follows: "The lens is an elastic structure, and when released from the flattening influence of its suspensory ligament tends to assume a spherical shape. During accommodation the ciliary muscle (especially the circular fibres) contracts, drawing forward the choroid and relaxing the suspensory ligament. This diminishes the tension of the lens capsule and allows the inherent elasticity of the lens to increase its convexity. The change in curvature affects chiefly the anterior surface of the lens." Tscherning has advanced a different theory. He maintains "that the ciliary muscle increases the tension of the suspensory ligament during contraction, and that this causes peripheral flattening of the lens with bulging anteriorly at its center." Helmholtz's theory is the one generally accepted, but that of Tscherning seems better to account for the distinct sense of effort which results in sustained accommodation, accommodation for the near point, and in presbyopia. They both agree, however, that "accommodation is an auxiliary power which the eye possesses to bring rays of light from near objects to a focus on the retina." How this is accomplished is perhaps yet to be discovered. This "auxiliary power" is present in all eyes: emmetropic, myopic, hyperopic, and astigmatic. In uncorrected hyperopia and astigmatism, accommodation is being used for distance, contrary to nature's intentions. The amount used depends entirely upon the error it is forced to correct.

It follows then, that the accommodation being exerted unnaturally to correct distant defects becomes depleted when called upon to perform its natural function—that for near vision, leading ultimately to asthenopia and all its symptoms.

It happens oftentimes that the accommodation, not only exerts enough of itself to correct the defect, but overexerts its function, and in that way brings the rays of light to a focus in front of the retina, as in myopia. The ciliary muscle undergoes a tonic contraction, which may remain constant until it is broken up, or in other cases it may be intermittent.

Spasm of accommodation may occur in any form of error of refraction and even in emmetropia, which is thus transformed into an apparent myopia. But it is most commonly found in hyperopia and hyperopic astigmatism, either simple or compound. When present in a hyperopic case, the spasm of accommodation simulates myopia in all its symptoms, the resemblance being particularly noticeable in the impairment of distant vision and the confirmed habit of holding print near the eyes. In these cases minus lenses are often accepted and may cause great improvement in distant vision.

Hitherto we have discussed varieties, classifications, causes and symptoms of hyperopia, all from a purely theoretical point of view.

We will next discuss corrections of the defect by the various methods as employed in our own refracting rooms and those which others have found to be most practical and useful. We find the following three methods the most satisfactory for testing and correcting hyperopia in all its forms.

1. Manifest,
2. Fogging,
3. Treatment lenses.

1. Manifest.—This method is used largely in presbyopic cases. It consists in ascertaining whether or not convex lenses improve vision. If they do, the strongest lens through which best vision is possible constitutes the correction. By this method the manifest hyperopia alone is corrected, and if used on young persons whose accommodation is strong, may result in an under-correction of the defect. The lenses thus found may become too weak after they are worn for a short period, and stronger ones may be required. As a portion of the latent hyperopia becomes manifest through the application of convex lenses and thus increases the defect.

2. The action of the convex fogging lens is to induce relaxation of the accommodation, as only in this way can the vision be made slightly better. The natural tendency for the ciliary muscle is to contract, but a contraction of this muscle when a convex lens is before the eye instantly makes vision very much worse. The eye is not slow to appreciate this fact, and then, as the natural instinct of the eye is for clear vision, the effort is made in the other direction; that is, in a relaxation of this muscle, which attends to slightly clear the vision, and thus a further relaxation is encouraged.

The usual mode of procedure is to place a strong convex lens in front of one eye, obscuring the other with an opaque disc. The lens used should blur vision so that the largest letters on the test chart 20 feet away are not visible, nor discerned. This lens is gradually decreased with concave lenses —0.25 D. Sph., at a time until best vision is obtained.

We find it frequently advisable to place a pair of strong convex lenses, the strength being equal to the individual's amplitude of accommodation, before the patient's eyes for from 15 minutes to 30 minutes, or more, depending on the age and condition of the patient prior to the examination. In young children whom we suspect to be hyperopic, the length of fogging should be extended to as long as possible, sometimes even going to the length of having them wear home the fogging lense. This, too, is to be done prior to the examination, thus aiding in relaxing the accommodation.

The remainder of the test is as outlined before. The fogging lenses are reduced with concave lenses, until the strongest lenses that give the best possible vision are found. The binocular prescription is then increased from +0.25 D. Sph. to + 0.50 D. Sph., first each eye separately then binocularly and results noted. It is frequently found

that this increase is accepted without difficulty, and thus more of the latent error becomes corrected.

The advantages of the fogging method over what I have termed the manifest are many. The most important being that the fogging method results in one being able to prescribe a stronger distance lens, because the accommodation being more fully relaxed it cannot disguise the latent defect by its own exertion.

The convex lenses used to fog the eyes have a repressing action, and therefore, lenses strong enough to make the accommodation inactive are to be used and allowed to remain before the eyes for a period long enough to accomplish this action.

3. Treatment lenses have a two-fold purpose: First, they help to determine the actual condition of the eyes; second, they relieve and brake up simulated myopia, caused by spasm of accommodation.

In any case of abnormal overuse of accommodation, which is generally the predisposing factor in a case of spasm of accommodation, treatment lenses should be prescribed instead of a cycloplegic, as they will prove much more effective. The strength of the treatment lenses used would depend upon the patient's general condition; the condition of the eyes; and the muscular condition. They should be of such power that they would by their action relieve or stimulate accommodation (as the case may require), either by subjugation, suppression or induction. In one case the lenses would check the unnecessary flow of ciliary energy by suppression; in another, would induce accommodative action by their application.

Uncorrected hyperopia and hyperopic astigmatism are the chief causes of spasm of accommodation. The patient, being unable to secure a sharp retinal image for any distance, naturally endeavors to counteract the effect of the error by bringing the object closer to the eyes in order to secure a larger retinal image with the result that excessive accommodation is exerted, and the action becomes habitual. It is only a question of time when the defect will show itself up in its true form, accompanied by a train of symptoms. The technic of most value in a case of this type is to prescribe a pair of convex spheres which will fog vision to at least 20/40, this correction to be worn constantly for a short period. In most cases its use will alleviate the condition by breaking up the spasmodic action of accommodation and permit the uncovering of the true error. Treatment lenses of this character are worn for a prescribed length of time, usually for from one week to one month, depending upon the condition of the eyes and the patient, before the final prescription may be given.

Muscular anomalies will often be the cause of spasm of accommodation. Innervational convergence insufficiency with hyperopia is a likely cause for that. When the efforts of accommodation and convergence are equal in binocular fixation, the accommodation may be in excess of what is needed for clear vision owing to an exorphoria, or when the accommodation is adjusted for 33 *cm.*, a considerable

supplementary convergence effort is required, during which accommodation must be suppressed to retain clear vision. In consequence there is muscular asthenopia, which finds relief in extra accommodation is permitted as when hyperopes or emmetropes wear concave lenses, and myopes those which overcorrect the defect. The remedy is to harmonize the functions of accommodation and convergence.

Treatment lenses can be used very effectively in determining this condition. A preliminary muscle test, both for tonicity and duction, taken when such a condition is suspected will determine the type of treatment lenses and just what may be expected from their application. If the manifest muscular error tends to increase upon the application of as weak a treatment lens, a +0.50 D. Sph. for instance (in suspected cases of muscular asthenopia the weakest plus lenses should be first tried), the condition is that of muscular anomaly, and should be treated as such.

For the sake of completeness let us discuss the action of lenses in correcting hyperopia in general, and "treatment lenses" in particular.

Every lens acts like a variable powered prism whose strength increases with the distance from its optical center; the base of this prismatic effect is toward the center in convex lenses and away from the center in concave lenses. The prismatic power in prism diopters, at any point in lines is numerically equal to its dioptral power multiplied by the points of decentration in centimeters. This is the law of lens effectivity as laid down by Prentice, and upon which lens effectivity calculations are based.

Convex lenses have their bases toward the center; and concaves, away from the center, causing in the convex lenses, convergence of all rays passing through them and in the concave lenses, divergence of these rays. Therefore, the hyperopic eye will require the base-to-base effect of the convex lens to converge these rays of light to their proper focus, and to neutralize the error without the use of accommodation.

The converging power of the convex lens has the same effect upon the eye as does the action of accommodation. It brings rays of light entering the eye to a nearer focus than would the hyperopic eye, in which the accommodation for distance is relaxed.

The convex lens has the power to converge the rays of light which enter the eye, and suppress the accommodative action of the ciliary muscle, thus giving this muscle a chance to rest and recuperate. This is the rule to be followed when treatment lenses are to be prescribed. In all cases of spasm of accommodation, simulated myopia, and asthenopia, the accommodation is taxed beyond its natural limits. Treatment lenses tend to substitute themselves for the natural energy exerted, and stop this waste by placing the ciliary muscle in a more relaxed position. The treatment lens is not the final prescription it must be clearly understood. The final prescription

may represent a formula altogether different than the treatment lenses which are prescribed for temporary use only.

Treatment lenses together with ocular calisthenics may be used successfully in building up amblyopic vision, or in cases where vision is lazy and irresponsive.

Ordinary plus spherical lenses mounted in inexpensive metal frames will serve the purpose for treatment wear. The frames must be properly adjusted, and the patient must be informed of their purpose and what to expect from them, thus insuring the fullest cooperation on the part of the patient.

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OCULAR-PSYCHOMETRY

Being an Outline of the Fundamental Principles Governing the Control of the Ocular Muscles.

By
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CHAPTER 3.

After the separation of the fibers in the optic nerve at the optic chiasma, so that the fibers from the right half of each retina go to the right half of the brain, and the fibers from the left half of each retina go to the left half of the brain, the fibers are then traceable to three portions of the brain. One group of fibers end in the Internal Geniculate bodies;[14] but upon tracing these fibers back, it is found that they do not continue to the retina at all. They travel along with the optic fibers to the chiasma and continue around to the Internal Geniculate body in the opposite lobe of the brain. Their function, logically, seems to be to acquaint one-half of the brain with the visual experiences of the other half. These fibers constitute "Gudden's Commissure."

A second group of fibers is traceable to the Pulvinar of the Optic Thalamus, and to the External Geniculate bodies. It is suggested by some investigators that the fibers to the Pulvinar deliver the impulses which give rise to emotional responses to retinal stimulation, but, for present, purely practical purposes, the External Geniculate and Pulvinar bodies may be considered as one. Here fibers from the retina end. There is no direct connection with any other nerve fibers, but almost in contact with the ends of the fibers from the retina are nerve cells which carry impulses from these bodies to the occipital cortex.

The third group of retinal fibers, comparatively few in number, but observably larger in size, end in the Superior Quadrigeminal bodies. The nervicity discharged by them is relayed by nerve fibers which lead from the Quadrigeminal bodies to the nucleus of the third, fourth, and sixth motor nerves. The nervicity from this group never reaches the cortex at all.

The nerve fibers from the retina ending in the Geniculate bodies are called the "visual fibers," for reasons that will be apparent later. Nerve fibers which relay nervicity from the Geniculate bodies to the cortex are called the "optic radiations." The fibers from the retina to the Superior Quadrigeminal bodies have been called the "pupil-

lary" fibers, which is obviously not completely descriptive as nervicity from them is relayed to the fourth and sixth motor nuclei as well as to the third nerve nucleus. Zoethout suggests that impulses over these fibers are responsible for all the protective reflex actions such as movements of the eyes, eyelids, head, and even the body in dodging rapidly approaching objects. Every person has had the experience of "dodging" a flying object without having been aware of "seeing" it. Observation of anyone's eyes will convince the observer that most eye movements precede visual conception, or thought, of the object which attracted the eye. This relay from the retina direct to the motion centers is the most logically acceptable mechanism for the performance of such automatic actions.

The occipital cortex may be described as a tangle of nerve cells, or brain cells, pyramidal in shape, the fibers of which are not insulated from each other. The brain cells of the occipital cortex are constantly being stimulated by nervicity delivered through all the sensory nerves; and that nervicity, as well as the nervicity produced by the brain cells themselves, is free to travel to any part of the cortex. One's first thought is that dreadful confusion must exist in the cortex; and in some brains that is true—(hysteria) but in the normal brain in some manner, not at all well understood, the nervicity is definitely directed through the cortex.[15] George Crile, M. D., Senior Consultant in Surgical Research, A. E. F., 1917-1918, Professor of Surgery, School of Medicine, Western Reserve University, Visiting Surgeon to the Lakeside Hospital, Cleveland, Ohio, U. S. A., in "A Physical Interpretation of Shock, Exhaustion, and Restoration," suggests that it is the function of the white matter to direct the flow of nervicity through the brain; but whatever the instrument employed, the ability of the individual to direct the flow of nervicity through the portions of the brain such as the Geniculate bodies, the Quadrigeminal bodies, and the cortex, is called "will power," "volition," "thought," etc.

This fact has been well established by common experience: That when nervicity has once been directed along a certain path in the labyrinth of brain fibers in the Cortex, Geniculate, or Quadrigeminal bodies, it follows the same path more readily the second time; and eventually, after much repetition, or under circumstances to be discussed in the next chapter, it follows the path originally selected by circumstance or will power without the necessity for "thought" or "attention." We then say that a habit has been formed, or that we have "learned" to do something. The prompt, direct precise reaction to an external or retinal stimulation without the guidance of attention or thought is called an "automatism." Some such reactions have become so well established throughout so many thousands of successive generations that they are now present at birth, and do not have

to be acquired by the individual. These are called "primary reflexes," or "instinctive reactions."

(Note: Inasmuch as the visual processes are all located within the cranium, nothing is said here of the spinal column. If the readers' thoughts turn to reactions to other than visual stimulation, or to bodily responses to visual stimulation, the spinal cord is as worthy of consideration as the brain.)

Perhaps the "mind" resides principally within the cortex; and it seems to be the home of "reason." Attempts to localize "brain centers" such as "combativeness," "idealism," "amativeness," etc., have always been popular, but few of these theories have been advanced by men who have extensively studied the brain itself. Knight Dunlap discourages the use of the term "brain centers," except in the sense that sensory impulses can be traced to definite portions of the cortex, and motor impulses, going out of the brain can be traced back to definite nuclei. The twelve centers assumed by Savage to exist cannot be demonstrated or located; and even the "color centers," "form centers," etc., are more a matter of convenience in discussion than of fact. However, it has been definitely shown that along the calcarine fissure of the occipital cortex certain small areas are so closely related to the retina that destruction of a certain portion of the brain at that point results in a definite scotoma of a certain portion of the retina; and that electrical stimulation of these areas will cause the eyes to rotate to the right or left, depending upon the area stimulated. Furthermore, the memory of things seen is lost if portions of the brain near the calcarine fissure are destroyed; so we may safely assume that the retina has a point for point representation somewhere near the calcarine fissure which enables us to interpret a given pattern of retinal stimulation in terms of visualized, or mental pictures of objects in space; and that this picture may be reproduced to an extent depending upon its original vividness and the individual's practice, without repetition of the original stimulation. Furthermore, it may be assumed that it is from this area that nervicity is directed to the motor "centers" (nuclei of the third, fourth and sixth nerves) when "thought," "attention," or "volition" directs the eyes toward a certain point in the visible world.

Nervicity generated within the brain, or cortex particularly, flows out along the fibers of the motor nerves; any or all of them, whether they lead to visceral muscles, skeletal muscles, or to the glands. The path followed depending upon the convenience of the outlet to the most active brain area; the developed paths of automatism; and the influence of "thought."

The influence of "will" is probably brought to bear in those areas where one nerve fiber ends and another begins. These "open contacts" between the axon (out-put end) of one nerve cell, and the

dentrons (in-take ends) of other nerve cells are called synapses; so it is that establishing automatisms, acquiring habits of action or thought, or learning to do anything, is often referred to as "synaptic training." But after the nervicity reaches one of the outlets, such as the motor nuclei, it can no longer be influenced by the "mind." It flows like an electric current to the point where it is "grounded" in muscle or gland.

The outlets to the muscles of the eye are the third, fourth, and sixth motor nuclei. It must not be assumed that a nerve, the fourth for example, consists of a single fiber. On the contrary, it, like the optic nerve, is more like a cable—a bundle of many fibers, each carrying nervicity from the nucleus to the particular muscle cell it is intended to serve. Furthermore, each of the motor nerves of the eye contain fibers that carry nervicity from the muscle cell back to the brain so that, on occasion, we become aware of a muscle "sense." Knight Dunlap observes that these returning afferent fibers are probably responsible for the exact coordination of the ocular muscles through the many fibers communicating between the third, fourth, and sixth nuclei, and the members of each pair. In other words, it is probably that the nervicity returning from the contracted right external rectus finds its way directly to the right internal rectus and aids in the extension of that muscle, and to all the other muscles, for that matter, aiding in their nice adjustment to the new point of fixation; and if the effort of contraction of a given muscle be abnormally great, the returning nervicity generated may be sufficient to make the individual "aware" of the contraction; yet we are never "aware" of our eye muscles under normal circumstances.

Neither must it be assumed that the nucleus of the third cranial nerve, which serves seven muscles of each eye, is a single brain area. The nucleus of the third nerve is strung out along the floor of the fourth ventrical to such an extent that seven more or less distinct areas, corresponding to the seven muscles served, have been definitely located. [16] One may safely assume the several muscles of the eyes to be controlled each by a definite group of brain cells which, like the keys of an organ, are capable of almost infinite combinations when played upon by the nervicity flowing out of the Cortex, the Quadrigeminal bodies, and back from the muscles themselves; and like the organ keys, they may be so played upon that pleasing harmony, or painful discords result.

The next chapter will deal with the delineation of natural, harmonious synaptic paths and offer suggestions for their development.

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THE AMPLITUDE OF ADAPTATION AS EXPRESSED IN PHOTOPTERS

M. Fischer of Copenhagen, has, with the able collaboration of Tscherning, devised and seemingly perfected a photometric glass. A glass to measure light-sense, or as Tscherning calls it, the Amplitude of Adaptation. This test can now be made in an exact way by means of this new product.

When Fischer first devised this glass, it was done in a research far from optometric lines but the results of his work were seemingly evident to practitioners on both sides of the water and it remained for that eminent scientist, Tscherning, to add to Fischer's work and direct the attention of those interested in visual tests to the full value of his experiments.

The photometric glass of Fischer is made by means of plates of gelatine which can be stained very exactly. These plates are then fixed by means of Canada balsam between two discs of plate glass. The glasses are so constructed that the separate rays, notwithstanding the great difference of wave length, are allowed to pass nearly in the same proportion; thus the color of the object viewed through the plates is left unchanged.

Tscherning, by means of Fischer's photometric glasses, has provided us with an instrument that is easy to manage and also gives a surprisingly perfect and exact result. The instrument consists of a series of plain dark glasses, which can be inserted in a light-tight frame. These glasses are constructed in such a way that No. 1 lets through 1/10 of the light; No. 2, 1/100; No. 3, 1/1000; and so on up to No. 10. In this manner the number of the glass indicates just how much light it lets through according to the following formula:

$$\text{No. X} = \frac{1}{10x}$$

If we take for instance No. 5, this glass will let through

$$\frac{1}{10^5} \text{ of the light thus } \frac{1}{100{,}000}$$

The great advantage of this construction is that we can simply add the numbers. No. 2 + No. 4 are equivalent to No. 6. We have here a simple and exact standard, analogous to our standard for refracting glasses. Just as the refracting power is expressed in "dioptres" (D.) so Tscherning proposes to express the light-absorbing power of his glasses in "photopters" (Ph.); and just as we speak about the "amplitude of accommodation" of the eye, which is expressed in dioptres, so he proposes the new name, "amplitude of adaptation," which is expressed in "photopters."

The frame consists of two very short tubes. The one is applied light-tight in front of the eye by means of two narrow bandages. For hygenic reasons a piece of black silk-paper with a hole in it for the eye, is placed under the frame. In the second tube the glasses are fixed, and then it is pushed into the tube in front of the eye. During the examination the other eye is covered.

As a source of illumination the flame of a stearine candle is used at a distance of half a metre. The room need not be dark but the light must not be too strong. The patient is seated with his back towards the windows. We now proceed to find the darkest glass with which the patient can just see the candle flame. The number of this glass corresponds with the amplitude of adaptation. If, for instance, the number of the glass is 9, then the amplitude of adaptation is 9 photopters. As is seen the examination is very simple and does not require very much intelligence on the part of the patient.

A differentiation must be made in making this test between the initial adaptation which takes place some time during the first few moments that the glass is in place and the secondary adaptation

which takes place within half to three-quarters of an hour. The findings of the later are the true findings and the ones to be used.

Investigating the results which have been attained with photometric glasses, Fischer (Brit. Jour. of Oph., Vol. 11, No. 11, p. 567) claims that the range of adaptation of the normal eye is from 9/10 Ph., at the start to from 8 Ph. to 10 Ph., at the end of a three-quarter hour period. This would indicate that the old figures of Heine, from 50 to 500 were wrong and that new limits of adaptation must be set at from 100,000,000 to 10,000,000,000.

Tscherning's method of measuring the amplitude of adaptation secures the full findings or readings and opens a new field for experimental work and research. C. C. K.

HEADACHES OF NASAL ORIGIN

No symptom is so frequently met with by optometrists as that of headaches, and it is well at times to remember that all headaches are not of ocular origin.

Nasal headaches which can be divided into two subdivisions, the inflammatory and the non-inflammatory, are believed to be due to the common nerve supply by the trigeminus, of the nose and accessory sinuses, and of the dura mater.

The diagnosis of a nasal headache of inflammatory origin is usually fairly simple. There is, as a rule, a swelling of the lids, a decided tenderness around the frontal area, and exophthalmus and at times a paresis of the various oscular muscles, to aid in making the diagnosis. Frequently, too, pain will be felt in the occipital region of the sphenoidal, the cheek and upper teeth in maxillary, and pain along the course of the supraorbital nerve in frontal disease.

There are three principal causes of non-inflammatory nasal headaches. These are:

(1) Simple pressure cases due to terminal nerve pressure resulting from deflected septum, hypertrophied turbinates or adhesions between the two. The resultant pain is mainly localized to the nasal bridge, orbit and temple, is worse in the mornings, and the sufferer is usually of a type possessing a low reserve of nervous endurance.

(2) The so-called vacuum frontal headache, which is described as a low-grade constant pain, worse in the mornings, and aggravated by near work, unrelieved by glasses. Ewing's sign, *e. g.*, tenderness on pressure over the upper inner angle of the orbit, is frequently present. The condition is produced by a narrowing of the frontal

sinus outlet into the middle meatus by means of an enlargement of the bulla in front, or processus uncinatus behind, or merely by a deflection of the septum.

(3) The nasal (Meckel's) ganglion neuroses. Slade, of St. Louis, has described the following syndrome occurring in such cases. The pain is generally felt at the root of the nose, in the orbit and upper jaw and may extend down the shoulder on the affected side, as far as the fingers. There may also be present, salivation, a perverted sense of taste (metallic) and scotoma scintillans.

C. C. K.

CYCLOPHORIA AS A CAUSE OF RECURRING CONVERGENCE INSUFFICIENCY

My theory regarding the rather frequent muscular anomaly known as Recurring Convergence Insufficiency is that the recurring loss of duction is caused by a malattachment of a muscle causing a torsion or a cyclophoria.

The image when this disorder is present was off the fovea and the action to rectify this was a drain on the nervous system causing the intense discomfort which patients suffering from this disorder experience. The oculo-prism treatments administered in cases of this type, build up the innervation so that the action of the muscle brought the image back to the fovea. The tendency, of course, is to obey the action of a muscle so, as the innervation was depleted there was a constant slipping of the image off the fovea. Being unable to build up a permanent false fovea, the nervous system rebelled against the use of the energy to maintain the image on the true fovea, and the apparent recurring convergence insufficiency was the result.

In brief, my theory is, that this disorder is caused by a malattachment of a rectii muscle and tests for cyclophoria should always be made when this defect is suspected.

Dr. E. O. Fjelstad.

ABSTRACTS

THE RANGE OF BRIGHTNESS WHICH THE EYE CAN STAND. E. Weiss. The Dioptric Bulletin (British), Vol. XXIX, Nos. 10 and 11, pp. 699-702. 1927.

Writing on various visual phenomena in a paper entitled, "Eyesight With and Without Glasses," Weiss claims that the range of field brightness covered by our eyesight reaches from about 1/2,000 of a Lux to about 80,000 Lux, and the highest degree of brightness which the eye can stand without being dazzled is about 150,000,000 times as great as the faintest only just perceptible light which can be discerned. The figures quoted are those made from laboratory experiments at the Nitsche and Gunther Optical Works, Rathenow, Germany. T. O. B.

REFRACTION WITHOUT CYCLOPLEGICS. T. H. Butler. The Canadian Optometrist. Vol. X, No. 8, pp. 228-231. 1927.

Butler, a British physician, gives the following reasons for discontinuing the use of cycloplegics in his refractive work: (1)—Accurate work can be done without the use of a cycloplegic. (2)—He believes that small amounts of astigmia are overlooked when the cycloplegic is used. (3)—Retinoscopy is more accurate without a cycloplegic than with it. (4)—Less time consumed in making a diagnosis of refractive error. (5)—Patients' objections to the use of the drug. (6)—Too upsetting to children, as it frightens them, thus defeating its own end. (7)—The use of a cycloplegic makes a post-cycloplegic refraction necessary, thus wasting time, and increasing the necessary fees which result. (8)—The danger of inducing Glaucoma. Butler claims to have had three such cases in his own practice before discontinuing the use of the drug.

He sums this all up by saying: "Ten years ago I was using atropine and homatropine for well over half my cases. Gradually I have used them less and less, till today I hardly call upon them once a month for adults, and not often for children over ten, and even younger, if they are intelligent. I have been able to review many of these cases after years, and, as far as I am able to judge, the results with a cycloplegic are not one whit better than those without

it. I have worked out hundreds of cases with and without homatropine, and in but a few has the drug helped me. In many cases I have got less hypermetropia after the instillation of a 2 per cent solution of homatropine three times an hour than I did without it.

"I have naturally detected occasional errors in my work without a cycloplegic, but I have found at least as many, if not more, after the use of a homatropine." C. C. K.

BOOK NOTICES

THE STEREOSCOPE IN OPHTHALMOLOGY. David W. Wells, M. D. 3rd Edition. Published by E. F. Malady Co., Boston, Mass. 1926.

This little volume which contains somewhat over 100 pages, is revised from the former second edition. The first having been printed in 1912, the second in 1918, and the third and latest edition in 1926.

Dr. Wells made an extensive study of the application of the stereoscope in ocular work and is convinced that the refractionist who does not make use of this instrument in the treatment of hethorophoric cases is not discharging his full duty to the patient.

The book is divided into nine chapters. The first three chapters deal with the general method of measuring of heterophoria and stereopsis as well as describing the different types of stereoscopes. The fourth, fifth and sixth chapters deal with the author's method of stereoscopic treatment in cases of esophoria, exophoria, heporphoria, amplitude of fusion training and recovery exercises. The author describes fully how the phorotometer may be converted into a stereoscope and goes into detail as to the type of cards to use, when and how to use them.

The seventh chapter deals with the stereoscopic treatment in esotropia and exotropia and gives the possible percentage of cures in these cases, while the eighth chapter discusses the advisability and importance of post-operative treatment along with the theories and psychic element of fusion.

The ninth chapter is entirely a new addition to the book and deals with the stereo-campimetry, which the author chooses to call the wide-angle-stereoscope. He discusses fully the principle involved in this instrument and describes how it should be used.

This small volume contains much information of value and deserves a place on the library shelf of the modern refractionist.

J. I. K.

REPORT OF THE 4th AND 5th ANNUAL CONVENTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY. Vol. 1. Published by the Academy, Dr. E. G. Wiseman, 232 Delaware Ave., Buffalo, N. Y., Chairman. 1927. 110 pages. Illustrated.

This is the first of what will be annual year books of the American Academy of Optometry. Volume I is divided into two parts. The first part being a report of the 4th Annual Convention of the Academy, held at Buffalo, New York, in December, 1925. The second portion being the report of the 1926 gathering which was held at Washington, D. C., in December of that year.

The first volume contains a short outline of the fundamental basic principles of the organization by Chairman Wiseman and a report on the previous history of the Academy by former Secretary Koch, as well as a reprint in full of the Academy's Constitution and By-Laws. This is decidedly proper in the first volume as it gives those readers not Fellows of the Academy as insight into the value of an organization of this character to the profession. The following papers are then published in this order:

Harmonizing the Ocular Functions. W. H. Hammond, Part 1, pp. 25-40.

Hammond reviews the tests made to determine the status and balance of the extrinsic muscles of the eye. His paper deals with the subject from the viewpoint of nerve exhaustion. The theories of Taylor, Bates and McFadden are mentioned and his technic of what he terms Neuro-Muscle-Oscular Treatment is outlined. Hammond is a firm believer in the Swinging-Lamp, the use of which he outlines in full. A discussion by Dean Ernest Petry follows the paper.

Focal Infections. W. A. Mendelsohn. Part 1, pp. 42-49.

Mendelsohn stresses the need for a more thorough examination of the antrums, the oral cavity and the sinuses pointing out in this paper the effects which focal infections in this region have upon the eye, and the system in general. The technic of transvisualization is mentioned.

Headache. E. G. Wiseman. Part 1, pp. 50-56.

Wiseman splendidly reviews the causes, types and location of headaches giving briefly, in fact almost in outline form, the chief contributing factors in each case.

Reconstruction Work as it Relates Particularly to Injuries to the Eye, Received by Soldiers During the World War. C. A. Taylor. Part 1, p. 57.

An abstract report of this illustrated lecture which was given by Taylor, who has been doing ocular work for ex-service men for the Canadian government. The report mentions the artificial structure work, attached to a spectacle frame used to improve the appearances of those whose injuries were of serious ocular nature. The paper is not printed in full.

Stereo-Campimetry. F. P. Barr. Part 1, pp. 58-66.

Barr reviews the need for this form of binocular perimetric work, going into some detail as to the diagnostic value of the technic.

Testing Speed of Vision. E. LeRoy Ryer and E. E. Hotaling. Part 2, pp. 12-17. Five illustrations.

Ryer and Hotaling have devised a rather simple device for testing the speed of vision, and also for testing the rapidity with which one may perceive an object and transmit visual stimuii into reflex muscular action. The later device is of interest in checking the vision of motor drivers. The former can be used advantageously in checking the rate of improvement in amblyopic treatment cases, and also in timing what Ryer and Hotaling term the Kletzky Interval, this being the time which elapses after the prism which produces diplopia has been removed, until the eyes again maintain single binocular vision.

Safety as Applied to Goggles. S. J. Owen. Part 2, pp. 18-26.

Owen outlines the factors involved in eye injuries in industry and classifies occupations which should use protective glasses. He then goes into detail as to the types of those glasses and makes several recommendations as to those of greatest value, his findings being taken from the data made on this subject at the Bureau of Standards, Washington, D. C., he being a member of its scientific staff.

The Bureau of Standard's Activities in Testing Glasses for Protecting the Eyes from Injurious Radiations. W. W. Coblentz. Part 2, pp. 27-30.

In this short report Coblentz reviews the work of the bureau's staff in measuring and tabulating the infra-red and ultra-violet rays and in devising protective measures to eliminate eye injuries due to these injurious radiations.

Systematic and Toxic Conditions that Affect the Eyes. B. Woodward Hazell. Part 2, pp. 31-36.

Hazell reviews the various toxemias and their resultant ocular diagnostic symptoms.

Dr. R. M. Peckham also presents a case of a patient whose uncorrected visual acuity was 20/40. Static skiametry showed three dioptres of hyeropia, but no plus lenses would materially improve vision. The singular part of this case, however is, that the application of a 1 degree, base-out plano prism at once increased visual acuity to 20/20. The discussion of this case by Drs. Peckham, Wiseman, Andreae and Bohall is given in full.

This work is published by the Academy in very limited quantities, and is distributed to all Fellows of the Academy. It may also be secured however, by any member of the profession, through the secretary, Dr. J. F. Andreae, Lexington Building, Baltimore, Maryland. The cost per copy is $5. C. C. K.

DISEASES OF THE HUMAN EYE. By Martin Cohen, M. D. Bausch and Lomb Optical Co. 1926.

Being a series of twenty-four illustrations showing diseases of the eye and a short account of the diagnosis. Thirteen of the figures are of fundus conditions as observed by the ophthalmoscope while the remainder of the figures are observations by the Hand Slit Lamp. As time goes on we may expect more and more of these charts of observations by the Slit Lamp as it has opened a new field of investigation by the application of focal illumination and microscopy to the anterior half of the eye.

E. O. F.

AN OUTLINE HISTORY OF OPHTHALMOLOGY. By Thos. Hall Shastid, M.D. F.A.C.S. American Optical Company. 1927.

This brochure is a reprint of Dr. Shastid's lecture before the Minnesota Academy of Ophthalmology and Oto-Laryngology on the high lights of ophthalmology from such early times as 2250 B. C. and he gives short accounts and the earliest known dates on the development of treatments of eye diseases, instruments in use at various times, first known writings on different phases of ophthalmology and in bringing the subject up to the present time he tells of the formation of University courses, hospitals, societies and the various journals.

E. O. F.

ANNOTATIONS
AND
SOCIETY PROCEEDINGS

The American Journal of Optometry is the official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Iowa, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania and Vermont Optometric Associations.

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The following gentlemen have consented to supply items of interest from their respective sections, acting in the capacity of

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□

INDUSTRIAL EYE SURVEYS

During the past several years certain optometrists who seem entirely lacking in principle have been busily engaged in making free visual surveys and selling glasses right and left to whomever could be talked into procuring them. This survey work is by most men engaged in it, a high-pressure glass-selling scheme, a decidedly vicious one, to be sure, and one which should be stopped at once if possible.

For the benefit of those not familiar with the tactics of these get-rich-quick artists, we will briefly outline their methods. First, the survey-specialist presents himself at the office of the superintendent of a large manufacturing plant. He arrives, armed to the teeth with statistics regarding visual defects and its effect upon production, health, etc. After completely befuddling the superintendent with his line of quasi-scientific sales talk, he proposes that he or his staff check over the eyes of the employees. This he will do,—"in this special case," without charge, reserving only the right to prescribe, —"at a very special fee," for a few of the most inefficient (from an ocular standpoint), employees. The benefits from this unusual and truly scientific service, he assures the superintendent, "will be remarkable." * * * *And indeed, they are!*

Once in the factory, the tactics are changed. No longer is our philantrophically (?) inclined optometric friend the smooth, bowing, smiling man of the superintendent's office—not at all—now he has suddenly become the stern eye specialist, selected at great expense by the firm to prescribe, willie-nillie, for all who come his way, and

woe be to one who demures, or who feigns to protest that $10.90 seems a bit high when his own optometrist usually supplies the material alone for about $8. The impression is easily given that those who refuse to do as bidden by this great doctor will incur the displeasure of the heads of the firm, and how many employees are willing to run that risk, so the "visual survey specialist" spends several busy days prescribing a lot of glasses, the large majority of which are of very low power, some even as low as O. U. + 0.25 D. Sph., or + 0.25 D. Cyl. axis 90. The poor sufferers who need these corrections so badly are therefore nicely fleeced and by the time the employees really find out what it is all about, our foxy friend is off for newer fields to conquer.

Now, who suffers most by this sort of goings-on?

The employees first, who are, in the main, stung! The executives of the plant second, because the employees blame them for permitting such people to come into the plant to prey upon them. This lowers plant morale. And third, all refractionists, good and bad, suffer inasmuch as these disgruntled employees judge all eye specialists by the type of crafty specimen with whom they have just had contact.

Now, what can be done about it?

The Los Angeles County Optometric Association have adopted a set of resolutions protesting the continuance of this type of shabby practice and calling upon the California State Board of Optometry and the A. O. A., to take the proper steps to put a stop to it. This may be effective, and we hope it will be. However, we believe the Minneapolis Association of Optometrists have hit upon a more effective weapon. This group of practitioners wrote several practical letters to each manufacturing plant in the city advising the superintendents and presidents of these companies of the fact that this nefarious practice was being followed and warning them of the results of permitting these self-styled "Industrial Specialists" with their "Free Surveys" to work around the plant. The Association further volunteered to make, a complete survey only, at a nominal fee, in any plant where desired, and in this way truly determine the exact visual status of any particular group of employees.

This method, while not entirely stopping the survey-artist, has, nevertheless, put a decided brake on his activities in that community. The Minneapolis Association of Optometrists is to be commended on their foresight, and it is hoped that they will continue their efforts from time to time by sending out additional material on the same subject. Other local societies are urged to do likewise and thus put a stop to a practice which seems at this time to be in a fair way, to disgrace the profession.

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COLUMBIA ALUMNI ASSOCIATION

At the annual election of the Optometry Alumni Association of Columbia University, New York City, W. Feinbloom, '23, was elected president. Feinbloom received his B. S. degree from the College of the City of New York and is now working for his master's degree at Columbia. He is past president of the Alpha Chapter of Omega Epsilon Phi. The other officers elected were Dorothy Weitzner, '24, vice-president; Grace Robin, '21, treasurer; Ida Dublin, '24, recording secretary, and Charles Jakle, '27, corresponding secretary.

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OKLAHOMA MID-YEAR CLINIC

The Oklahoma Association is holding its Mid-Year Clinic at Tulsa, January 9th to 12th. Dr. R. M. Peckham of Waterbury, Connecticut; Dr. C. F. Shepard of Chicago, and Dr. J. C. Copeland of New York City, will be the principal speakers. The meeting will be held at the Mayo Hotel. Dr. W. S. Farmer of Oklahoma City, and Dr. E. B. Alexander of Duncan, are in charge.

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THE NEW JERSEY ASSOCIATION

Dr. Leo. M. Mayer, of New York City, president of the American Optometric Association, will address a meeting of the New Jersey Optometric Association in Jersey City, N. J., January 18th, 1928. The meeting will be held at the Elks Club, and is in honor of the Association's Silver Anniversary.

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THE NEW ENGLAND CONVENTION

The Annual Optometric Convention of the New England States will be held at Boston, Mass., March 12th, 13th and 14th. Technical papers will be read and the Edison Company will demonstrate special illuminating devices which are made to protect the eye from glare yet at the same time give ample illumination.

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CREATIVE OPTOMETRIC WORK

"What optometry most needs, and must develop," writes Ryer, "if she is to take her place as a separate profession, is the ability on the part of a number of its practitioners to do creative, original, productive work on a purely optometric basis." This is true, and we are glad to state there never has been a time in the history of the profession when more original thinking has been done than at the present time. However, we must not pause here. More and more experimental work must be started and more and more study must be applied to, the ofttimes though simple, yet very important, phases of ocular refraction, with resulting normal and comfortable vision. The American Journal of Optometry can help its readers in several ways in their experimental work and stands ready to do so. We can assist him in getting in touch with certain information necessary to

his work. We can frequently put him in touch with others doing similar experimental work and help them work out their problems jointly and last, we can publish their findings. Optometrists the world over should feel free to call upon us for what assistance we can offer.

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PENNSYLVANIA STATE BOARD

The Pennsylvania State Board of Optometry announces, through its secretary, Dr. A. M. Peters of Danville, that the standard examination will be held in the South Office Building at Harrisburg, Pa., January 16th, 17th and 18th, 1928.

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THE MAINE CONVENTION

Dr. Howard L. Bryant, secretary of the Maine Association of Optometrists, announces that the annual convention of this organization will be held at Portland, Wednesday, January 11th, 1928. The following papers will be read: "School Examination of the Child," by Dr. J. L. Pepper. "The Fitting of Bifocal Lenses in Anisometropia and Oblique Astigmia," by J. D. Gamble, and "The Additive Phoroptor," by W. Forshay. It is expected also that Mr. Scott Sterling will also be in attendance. An annual banquet will follow the reading of the papers.

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MINNESOTA'S ANNUAL CONVENTION

Dr. E. G. Wiseman, of Buffalo, New York, will be the chief speaker at the Annual Convention of the Minnesota State Association of Optometrists, in February of this year. The meeting will start on Sunday morning, and the educational program will last three days. It is believed that Dr. Wiseman will speak to the Michigan men at their convention while en route to St. Paul, the meeting place of the Minnesota group. He will probably also talk before the South Dakota Optometric Society before returning to Buffalo. Their meeting is to be held in Watertown.

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THE AMERICAN ACADEMY

The following papers were presented at the recent annual gathering of the American Academy of Optometry in New York City. "The Evolution of the Human Eye," by Professor F. A. Woll; "Visual nerve Tracts, by Dr. R. M. Peckham; "Muscle Anatomy and Physiology," by Professor F. A. Woll; "Kratometer Technique," by Dr. O. L. McCulloch; "Complacency," by Professor R. B. Raup; "Ancient and Modern Theories of Light," by Professor J. P. C. Southall; "Better Control of Myopia," by Dr. E. LeRoy Ryer; "Duction Tests," by Dr. R. L. Peckham; and the "Evolution of the Visual Apparatus," by Dr. E. G. Wiseman. The three-day meeting closed

with the Annual Academy's Formal Round-Table dinner, at which the officers for 1928 were selected. They are as follows: Dr. E. G. Wiseman, chairman; Dr. B. Woodard Hazell, vice-chairman, and Dr. J. Fred Andreae, secretary and treasurer. The Council is made up of the above named officers and the following: Dr. J. H. Drakeford, Dr. F. S. Tibbetts, Professor Charles E. Cox, Dr. Carel C. Koch, and Dr. Benjamin Bohall. Chicago was named as the 1928 meeting place.

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ON PROMISING RESULTS

"The editorial in the December issue entitled 'Brain Adaptation as Related to Ocular Refraction,' by Glazer," writes Ohlsson, "merits a wide and careful reading, inasmuch as it contains a diagnosis of many of our optometric ills. The rush to get the fee, is frequently the reason for our patients losing any confidence they may have had in us, or any that a careful examination may have built up." "Glazer," continues Ohlsson, "has placed his finger directly on the very vital question of promising results, and it would be well for us all to get his full thought, and incorporate it in our technic." We all are, or should be, working towards the goal of developing fatigued visual organisms back to normalcy and we must keep in mind that to do this, takes time. Two things must be remembered, the first is that we are not "selling glasses," and the second is that we are prescribing knowledge and service, based on our ability to utilize light, so as to place a normal image on the retina, and to in addition, bring about that desired coordination between accommodation and convergence which will result in comfortable and efficient binocular single vision.

In this modern and hustling era of the world, very few cases come to the optometrists who have not some muscle complication, and bold is he, who can make a prognosis as to the immediate effects of the lenses just prescribed. Only time and careful attention can determine this, hence the impropriety of promising immediate or permanent results.

ULTEX THE ABLE

INHERENTLY, the Ultex One Piece Bifocal Lens is a shining example of the lens maker's skill. It is notably excellent in design and satisfactory in results.

But when the Ultex is ground from one homogeneous piece of Bausch & Lomb optical glass; when it is surfaced with the most painstaking care; when it is inspected with characteristic Bausch & Lomb precision—then, indeed, might it justly be called "Ultex the Able."

Just as the segment designations A-B-L-E spell "able," so do Bausch & Lomb Ultex lenses spell supreme satisfaction to the user.

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